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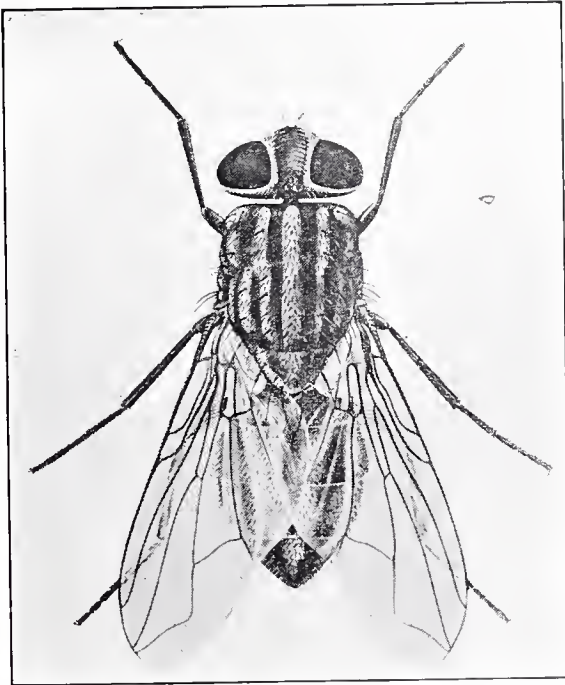
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# Insect Pests of the Household



The House Fly  
(Enlarged)

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# Insect Pests of the Household

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Insect inhabitants of the households are quite general throughout the world. Many of these creatures cause a loss to man by either consuming or contaminating his food, destroying his clothing and furniture or by spreading disease. For ease of discussion those found most commonly in this part of the country are grouped according to the type of damage caused by their activity.

## INSECTS COMMON WHERE FOOD IS STORED

Several insects are oftentimes present in pantries and destroy either by feeding, or contaminating any food material which may be exposed.

### The Cockroaches<sup>1</sup>

The cockroaches, (See Fig. 1), of which there are several species, are probably the most offensive insect infesting human habitations. These creatures inhabit pantries, kitchens, and bakeries; and are found about steam and hot water pipes, and other warm and moist places. They are very thin in body structure which enables them to go through almost any crack in the woodwork of the buildings. They prefer darkness to light, and seldom appear in the day. They feed on almost everything, but prefer dead animal matter, fermenting cereal products and other food materials. They also attack clothes, leather and the bindings of the books to get the starchy materials in them.

**Control.** Sodium fluoride, a white powder, is probably the best remedy for roaches. Places frequented by the pests should be thoroughly dusted with the fluoride. The dust clings to the appendages of the insects; and in cleaning themselves they swallow enough of the poison to cause death.

Powdered boracic acid can be used as a substitute when sodium fluoride is not available. Common borax does not give results. Commercial roach powders containing fifty per cent or more of sodium fluoride can be used in place of the pure powder. Remember, the sodium fluoride is the part that kills.

<sup>1</sup> *Blattella germanica* L. and others.

### CAUTIONS IN THE USE OF POISONS

In using the several poisons, recommended in this bulletin, for the control of household pests, extreme care must be used to keep the material out of reach of irresponsible persons, especially children, domestic animals and birds.

**Caution:**—Sodium fluoride is poisonous to human beings if consumed in large quantities hence care must be taken that the material is not brought in contact with food, or allowed to remain in places where irresponsible persons may reach it.

For the large roach, (*Periplaneta sp.*) Pettit of Michigan prepared a poison bait as follows: Make a thin gruel of cotton-seed meal sweetened with a little molasses. Prepare this by cooking in a steam cooker. When cool add a cake of yeast to start fermentation. When fermentation has started stir in a small quantity of powdered arsenate of lead. Put the bait on plates and place where

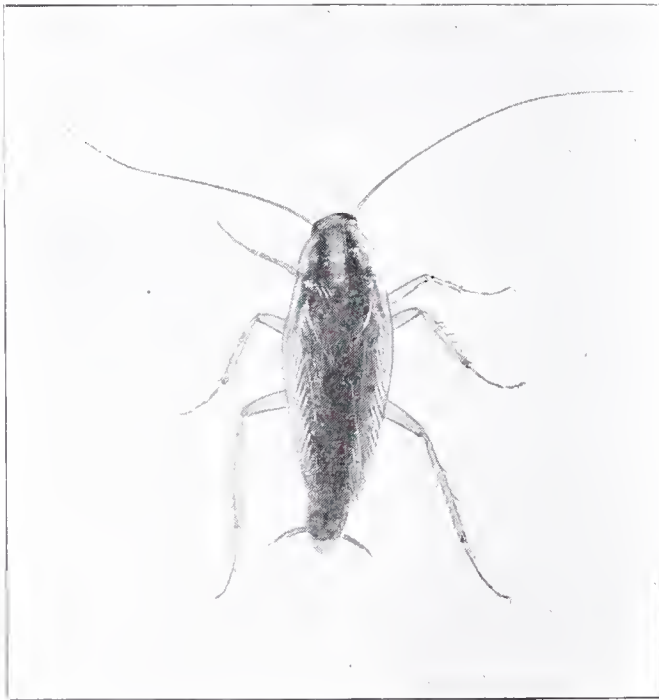


Fig. 1 The Cockroach (Enlarged)

convenient for the roaches to reach it. Upon drying out the bait loses its attractiveness, and to make effective it is necessary to moisten it about once a day. The secret of the success of this poison bait is the attractiveness of the fermenting sweets. Remember the mash is poison and must be kept from domestic animals and irresponsible persons.

## The House Fly<sup>2</sup>

The house fly (See cover page) is universally present, and has been much discussed in recent years, particularly in its relation to human health. It is now generally believed that many of the so-called summer diseases are spread by the house fly and that contamination of food is hastened by the contact of the fly. The house fly multiplies at a tremendous rate. One female is capable of depositing from 150 to 600 eggs. The eggs hatch in a few hours and the maggots may become full-grown in from five to seven days. The complete life cycle is run from ten to twelve days. In the average summer season there is opportunity for from ten to twelve generations.

**Control.** It takes a community action to bring about a satisfactory control of the house fly. The proper screening of residences and the covering of any attractive food are control measures well known, and need not be dwelt upon. In controlling the house fly much attention must be paid to the breeding grounds. The house fly lays its eggs in fermenting material of one kind or another; such as, manure piles and decomposed vegetation; and such breeding grounds must be eliminated over the whole community before a control is possible. A single untreated manure pile will furnish flies enough to menace the health of an entire community. All such breeding places must be covered, or treated with some material which will kill the developing maggots. Liberal applications of powdered borax is probably one of the best materials to use in this connection. Manures may also be treated with a solution made by placing one-half pound of hebeore in ten gallons of water. The manure pile should be sprinkled with this mixture, especially along the edges. The above amount is enough for ten cubic feet of manure (about 8 bushels.) The removal of all the manure from the heap each week, and spreading it thinly over the ground will prevent flies from breeding in it. Fly traps, fly paper and poison baits should be used freely. A poison bait which is frequently used with success, especially when there is a lack of other attractive food is made as follows: In a pint of equal parts of water and milk place one tablespoonful of formaldehyde (forty percent). This is placed in shallow vessels where the flies may have free access.

**Caution:**—This bait should be kept out of reach of children and domestic animals.

## Ants About The House<sup>3</sup>

There are several species of ants infesting houses, building their nests in the woodwork and masonry, or in articles of furniture. In heated houses they breed the year around and feed upon food found in the kitchens and pantries or scattered about living rooms. There are other species that live in lawns, gardens or under walks near houses and enter dwellings on foraging expeditions, or become accidental guests.

**Control.** The ants infesting houses can be divided into two general classes, the little red ants that prefer grease, the larger black

<sup>2</sup> *Musca domestica* L.

<sup>3</sup> *Monomorium pharaonis* L. and others.



ants (the carpenter ants) and the large brown ants that like the sweets. To kill the sweet-loving ants place one part of tartar emetic in twenty parts of honey. Put this where it can easily be reached by the ants. The poison acts slowly thus enabling the ants to carry it as food to the nest and there kill the queen and young.

**Caution:**—The dish must be covered and labeled so that children and other irresponsible persons will not get into it by mistake.

To kill the grease-loving kinds rub a little of the tartar emetic into a bacon rind, or if that is not convenient, mix the tartar emetic with grease, one part to 20 parts. Use the same safety caution as with the poisoned honey.

Another method of control is dusting wherever the ants frequent with a liberal supply of sodium fluoride. This compound kills the ants by contact.

Washing unpainted woodwork with a one to 1,000 solution of mercuric chloride will repel some species of ants. This solution is prepared by placing one one-grain tablet of the mercuric chloride in one quart of warm water. This solution is a very deadly poison and care must be taken in its use.

### The Indian Meal Moth<sup>†</sup>

The Indian meal moth is a common household pest. The larval, or worm stage is found in a number of foods, such as flour, cracked

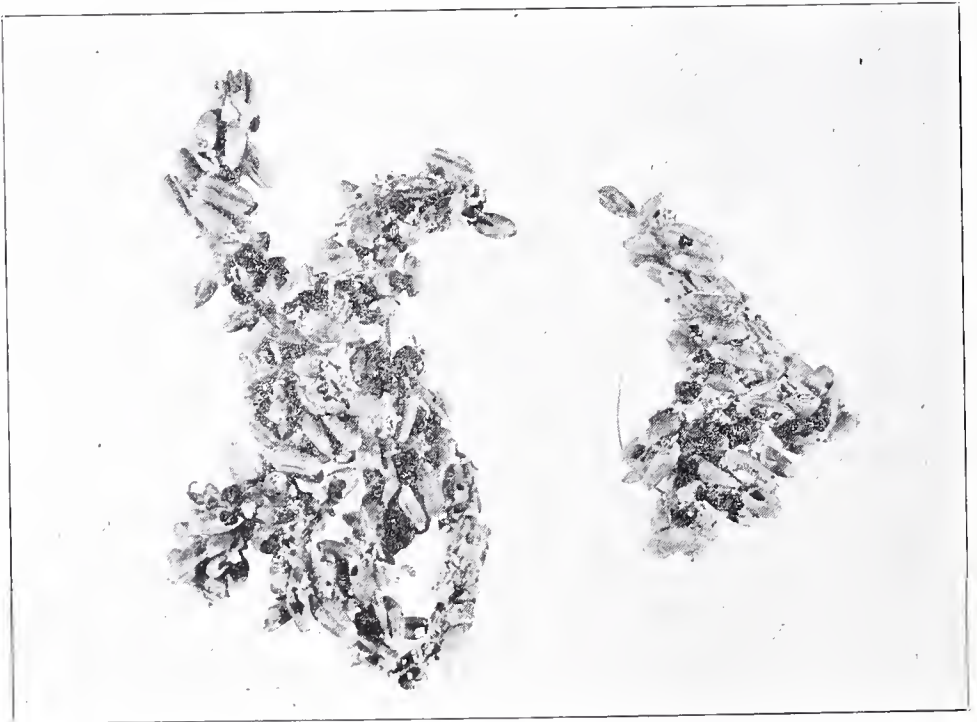


Fig. 2. Wheat Webbed Together by the Indian Meal Moth

grains, nuts and dried fruits of all kinds. In fact, this insect is the one which is usually concerned when the food is webbed together. (See Fig. 2) In feeding the worms not only consume a

<sup>†</sup> *Plodia interpunctella* Hufner

part of the food, but have a disagreeable habit of webbing particles of food and its waste products together thus actually rendering much of the infested material unfit for food.

**Control.** To control this insect probably the easiest method is to place the infested material in an oven and heat to about 130 degrees, and keep this temperature until all of the food is heated through. The heating of food materials, such as dried fruit, cracked grains and the like, which are intended for storage, is an excellent practice, and will prevent infestation, if after such heating the food is placed in tight paper bags and sealed shut. The heat not only kills the small worms which may be present, but also kills the eggs. In large quantities of infested material the insects may be killed by fumigating with carbon bisulfide. Before using this material be sure to read the paragraph given later on hints on how to fumigate with carbon bisulfide.

### The Larder Beetle<sup>5</sup>

The larder beetle is a dark-brown beetle about one-quarter of an inch in length. It has a yellowish-brown band across the upper part of its back. It infests many kinds of meats and

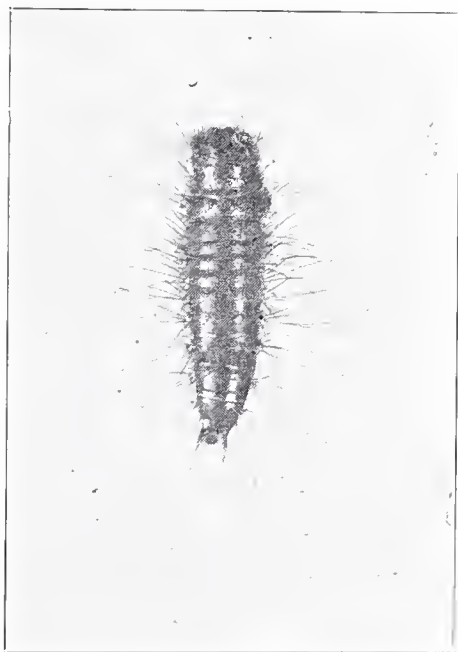


Fig. 3. Larva of the Larder Beetle. Enlarged

old cheese. It is, also, found sometimes in feathers and hair, and has been recorded as damaging woolen cloth. The worm stage is about one-half-inch long when full grown and has a number of hairs distributed over the body. (See Fig. 3). This insect occurs more frequently in storehouses than it does about pantries.

<sup>5</sup> *Dermestes lardarius* L.

**Control.** Fumigation with carbon bisulfide is probably the best means of control. Cured meats may be protected from this beetle by a liberal application of a wash composed of a saturated solution of borax. This solution will not penetrate the meat to any great depth, and usually protects it from this beetle.

### The Bean Weevil<sup>6</sup>

Stored dry beans may oftentimes be badly damaged by the presence of the bean weevil. (See Fig. 4). The adult is about one-eighth of an inch long, and is brownish gray, or olive in color. The damage is done by the feeding of the larval or grub stage. The initial infestation of the bean takes place in the field, the adult laying her eggs upon the pod, in holes in the pod made by the jaws, or in cracks caused by drying or splitting of the pods. The eggs hatch in from five to twenty days, depending upon the weather; the larva enters the bean, where it eats and lives until it emerges as an adult. The larval period lasts from eleven to forty-two days, and the pupal stage from five to eighteen days. A period varying from twenty-one to eighty days is necessary for the entire life cycle. The exact time depending upon the time of the year and the locality. Several generations, probably four or five, are produced each year in Pennsylvania.

From one to twenty-eight larvae have been found in a single seed. Infested beans are not good for seed, and should not be



Fig. 4. Beans Damaged by the Bean Weevil

planted. While 50 percent of the beans may germinate, the injury done to the seed by the weevils is such that the plants will not be vigorous nor productive. There is no practical method of pre-

<sup>6</sup> *Mylabris oblectus* Say.



venting the infestation of the beans in field. Since the beans are infested when they come from the field, they must be treated to prevent further damage.

**Control.** One of the best methods of exterminating the bean weevil in the seeds is fumigation with carbon bisulfide. This must be done in an air-tight receptacle. Place the carbon bisulfide in a shallow pan on top of the beans, close the receptacle tight, and let it stand forty-eight hours without opening. Use one ounce to the bushel of beans. The temperature of the beans to be treated should be 65 degrees F. or higher. Failure to kill will result if the temperature is lower. Before making this treatment see precautions on use of carbon bisulfide as given under the topic on fumigation.

Heat is also a good method of killing the larvae in the beans. If the beans are heated to 125 degrees F., and held at that temperature for half an hour, all stages of the insect will be killed. Spread the beans out thinly (one inch deep) in shallow pans, and place in the oven. Leave the door ajar, and raise the temperature to 125 degrees F., or 130 degrees F. It must not reach 140 degrees F. or higher, as there is danger of injuring the germination qualities of the beans.

Air-slacked lime is a preventative from further infestation of the beans, the larvae in the beans will mature and the adults emerge, but another generation will not develop. Use equal parts of air-slacked lime and beans, mixing them thoroughly. Place in a tight vessel such as a barrel, and be sure that the top is covered with lime.

### Other Insects Common about the Pantry

There are several other insects which may be found about the pantry at times. These for the most part are the same as are found in flouring mills. The treatment with heat, or fumigation with carbon bisulfide are probably the easiest methods of controlling such pests.

## INSECTS ATTACKING HOUSEHOLD FURNISHINGS

There are several insects which are concerned in the destruction of household furnishings. These creatures attack the material used in upholstering furniture, the wood of which the furniture is made, carpets and rugs, and in fact nearly all of the furnishings found about a house; and stored clothing. Carpet beetles, sometimes referred to as Buffalo Moths, tobacco beetles, and clothes moths are the worst offenders.

### Carpet Beetles<sup>7</sup>

The carpet beetles are oftentimes referred to as the "Buffalo moth," or "Buffalo bug." The worm stage of these creatures is about one-

<sup>7</sup> *Anthrenus scrophulariae* L. and *Attagenus piccus* Oliv.

quarter of an inch in length, and is heavily covered with brown hairs. The beetle stage is seldom seen; in this stage the insect feeds on the pollen and nectar of flowers. They are dark-colored creatures and are about an eighth of an inch in length. They may be found at certain seasons of the year on window panes of residences. The injury in the household is caused by the worm stage. (See Fig. 5).

**Control.** When a house is heavily infested with this insect, it requires heroic measures to break up the infestation. Carpets and rugs should be removed and thoroughly cleaned and aired, and sprayed with a high grade of gasoline. The cracks about the wash-board should be thoroughly cleaned with a brush and soaked with kerosene. The cracks of the floors should be cleaned out and filled with a good crack filler. This will break up a favorite breeding place for the insects. The infested upholstering of furniture presents a difficult task. If the infested pieces are completely soaked with high-grade gasoline, the insects will be killed.

**Caution:**—In using gasoline it must be continually remembered that mixtures of gasoline fumes and air are highly explosive, and may be set off with such slight sparks as that of turning on and off of electric light, hence its use should be confined to such places as may be freely aired, or better still in the out doors.

High temperature may be employed in the control of insects in upholstered furniture. Where a temperature of 130 degrees may be maintained until it has reached every part of the infested up-

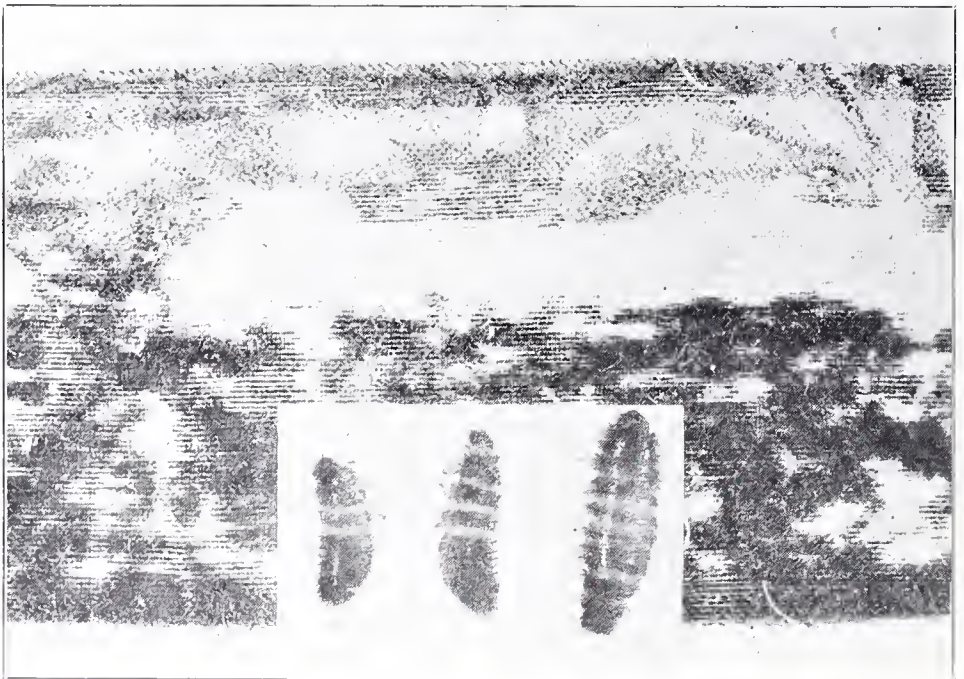


Fig. 5. Carpet Damaged by Larvae of the Carpet beetle.  
(The Larvae are Shown in the Insert)

holstering, insects present will be killed. This method has been employed in some cases with success. The difficulty in its use comes in maintaining the temperature for a period sufficient to

have penetration to all of the infested parts. Where possible the infested pieces of upholstered furniture should be sent to an establishment equipped with a room for fumigation with hydrocyanid acid. If this fumigation is done by an expert with the temperature at 70 degrees, or above, the control will be complete.

### Clothes Moths<sup>8</sup>

Clothes moths rank with the Buffalo moth as a serious pest of household furnishings and stored clothing. The adult form of this creature is a small gray moth with a spread of wings of about one-half inch. The larvae form a web as they feed on the infested articles. In houses which are heated these creatures may continue work throughout the year.

**Control.** When the clothes moth is found in carpets and furniture the carpets should be removed from the house and thoroughly cleaned and allowed to remain in the sunlight for one day. This will kill all of the larvae present. For the control of the clothes moth in furniture use high-grade gasoline. The pieces of furniture should be thoroughly saturated with the gasoline. In using gasoline always remember that it is highly explosive and must be used on an outside porch, or in a room with windows and doors open. One must be very careful to see that there are no fires of any kind, or even electric sparks in a room where gasoline is being used.

Woolen clothing, furs and various household articles made of wool or fur while in storage are frequently severely damaged by the attack of the clothes moth, and the larval stage of certain beetles. This loss can, in a large measure, be prevented by the practicing of the following measures:—

Clothing or household furnishings which are to be stored should first of all be well aired and exposed to sunlight for a day, turning frequently to expose all surfaces to the sun for an hour or more. After which each piece should be well brushed. Tight containers should be used for storage. Paper bags provided with an opening which may be tightly closed are recommended. Woolen boxes or chests, or paste-board boxes are satisfactory if they are made tight and provided with close-fitting lids.

After sunning and brushing, the articles should at once be placed in the storage containers, and the contents fumigated by the use of one of the following:—Carbon bisulfide, carbon tetrachloride, or paradichlorobenzene. Directions for the use of these compounds are given under the paragraph on fumigation in the last pages of this bulletin.

### The Cigarette Beetle<sup>9</sup>

The cigarette beetle at times may do considerable damage to overstuffed furniture. As its name implies this insect was primarily considered a pest of dry tobacco, but it is known to feed on a large variety of materials.

<sup>8</sup> *Tinea pellionella* L. and *Tineola biselliella* Hummel.  
<sup>9</sup> *Lasioderma serricorne* Fab.

**Control.** The control as outlined for the carpet beetle is effective against the cigarette beetle. See page 10.

### Termites or "White Ants"<sup>10</sup>

Under extraordinary conditions termites may become so numerous about the house that they may attack furniture and books in libraries. These creatures are usually confined to the timbers of a house, and do a very heavy damage in such places.

**Control.** When furnishings are attacked by these creatures, the only remedy is the destruction of the termites' nest; since termites must be in contact with moist soil, the remedy is that of seeing that such contact is broken up. It may become necessary to raise the house from the ground and replace infested timbers. Concrete foundations usually prevent further trouble from termites.

### Crickets About the Household<sup>11</sup>

Crickets oftentimes are found about households. (See Fig. 6). When they are numerous, they may cause damage to stored fruit and fabric of one kind and another about the house. These creatures

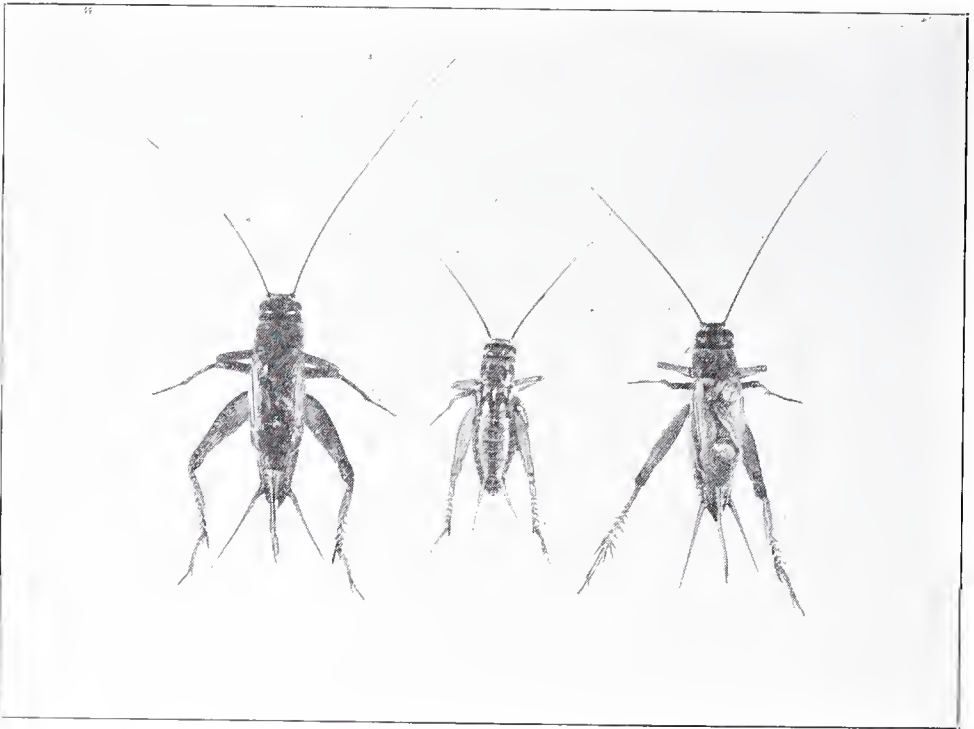


Fig. 6 Household Cricket

may be controlled by dusting sodium fluoride about as recommended for the control of the roaches. If extremely numerous, fumigation of the infested portion of the house may be necessary.

<sup>10</sup> *Termes flavipes* Kollar and others.

<sup>11</sup> *Gryllus domesticus* L.



## INSECTS ATTACKING MAN

The Bedbug<sup>12</sup>

Every good housekeeper dislikes to have this disgusting human parasite in the home. It is not generally known among housekeepers that this little "visitor" will migrate from one house to another, passing through cracks in walls or along the water pipes or gutters. Migration from an infested house is sure to happen, if the human occupants leave.

During the day these pests hide in all sort of places; in the cracks of the floors, under the washboards, and wall-paper, in the walls; and where wooden beds are used they can be found in the cracks and under the slats. The activity of bedbugs is regulated by the food supply. They feed exclusively upon human blood, and can go long periods without food. Experiments have proven that adults can live for months without food, and the newly hatched bedbugs have been known to live many days without ever having had food. Figure 7 gives an idea of the shape of this pest.



Fig. 7. Top View of a Bed Bug Greatly Enlarged

**Control.** Probably the employment of fumigation applied to the entire house is the most satisfactory method of exterminating an infestation of bedbugs. These methods are given on pages 18 of this bulletin. Sometimes it is possible to destroy a light infestation localized in one room by thorough soaking of the bed and other places in which the bugs may find shelter with high-test gasoline. A squirt gun should be used in injecting the gasoline into the cracks; all stages of the insect will be killed if soaked with gasoline.

<sup>12</sup> *Cimex lectularius* L.



**Caution:**—In using gasoline it must be constantly kept in mind that it is highly inflammable and explosive when mixed with air. The windows should be open when treatments are made, and for some time after to allow the fumes to escape. All fires and electric sparks must be kept away.

Some housekeepers have been successful in cleaning up a local infestation by using a 1-1,000 solution of mercuric chloride. This solution is sprayed finely into the hiding places of the bedbugs.

**Caution:**—Mercuric chloride is a deadly poison, and much care must be used in keeping the solution and the compound out of reach of irresponsible persons. The solution also corrodes metals.

When an infestation is confined to one room it is practical to fumigate just that portion of the house.

### Cat and Dog Flea<sup>13</sup>

In houses where cats or dogs are kept as pets, fleas of these animals may become quite numerous. (See Fig. 8). The small, ovoid, creamy-white eggs of the flea are deposited loosely among the hairs of the cat or dog, and fall out upon mats, rugs, carpets, or material in the dog's or cat's bed. The eggs hatch in from two to twelve days.

The larva is a minute, worm-like creature, white in color, and active; which feeds upon animal and vegetable debris, including



Fig. 8. The Dog Flea. (Greatly Enlarged)

the excrement of adult fleas. The skin is shed two or three times before becoming full grown. Four days to several months

<sup>13</sup> *Ctenocephalus canis* Curtis and *C. felis* Bouche.

are required for the completion of this stage. The pupal or resting stage is passed in a silken cocoon, and the insect may remain in that condition from three days to more than a year, depending upon temperature and other conditions.

**Control of Fleas.** Keep dogs and cats out of doors. If they must be kept on the inside, they should be kept very clean. Washing the animals with a saponified solution of coal-tar creosote preparation, several of which are on the market under the name of "stock dips" will kill the fleas. (Caution—Care must be used since coal-tar preparations may poison cats.) Leave the animal in this for five or ten minutes before removing. In the case of a cat, which has tender skin, wash the dip out with plain soap and water to prevent burning. Several strong, carbolic dog soaps on the market are quite effective when used frequently. Kerosene emulsion is also effective. Shave two ounces of laundry soap in one quart of boiling hot water, and when the soap has dissolved and the water brought to a boil, remove from the fire and add two and one-half pints of kerosene. Agitate violently with an egg beater to thoroughly mix it. If soft water has been used, and the work well done, the oil will not separate from the water. Free kerosene would burn the skin of the animal. To use, dilute to make five gallons and use as a wash. In some cases it may be necessary to repeat the treatment. Another way to remove the fleas from the pets is to rub or dust them thoroughly with pyrethrum powder. The powder must be thoroughly worked through the hair. This stupefies the fleas, and they will drop from the animal, and can be brushed up and burned.

The bedding upon which cats and dogs sleep must also be thoroughly cleaned by sweeping, shaking, or (better) soaking with gasoline, so as to kill all stages of the flea. Brushing and sweeping alone are insufficient, as the insects burrow down into the fabric and cannot be removed easily.

When the fleas are abundant in the house, the rugs and carpets should be removed and thoroughly cleaned. If the cleaning is done on the inside the dirt should be burned, since it will contain many eggs. Floors should be thoroughly scrubbed with hot soap suds and cracks drenched with kerosene.

Sometimes it is practical to use flake naphthaline as a control of fleas in houses. Five pounds of naphthaline should be scattered over the floor of an average sized room, and the room tightly closed for twenty-four hours. The naphthaline should then be swept up and spread over the floor of another room, and this room in turn closed for twenty-four hours. Continue until all infested rooms have been thus treated. After the last room is finished burn the naphthaline and sweepings.

In extreme cases of flea infestation it may be necessary to fumigate the entire house with sulphur, or hydrocyanic acid. See paragraphs on fumigation.

## The Head Louse<sup>14</sup>

Under normal conditions the head louse is difficult to find in most communities; and while for the most part it is found usually on persons of unclean habits, anyone is liable to become infested. It is no disgrace to acquire them, but it is considered a sign of uncleanliness to retain them.

The head louse multiplies rapidly. A female is capable of laying about 50 eggs in the course of six days, and each egg will hatch in about six days, and the young become mature in about eighteen days. Thus, under favorable circumstances the life cycle may be complete in one month.

**To Control the Head Louse.** Wash the head with a two per cent solution of carbolic acid; or with a mixture of equal parts of kerosene, and olive oil. White precipitate ointment is also said to kill. Washing the hair with strong vinegar will remove the eggs. Any of the above treatments should be applied at night and the head thoroughly washed the following morning with soap and water.

## Mosquitoes<sup>15</sup>

There are many different species of mosquitoes which are of importance to man and attack him both in the household and out-of-doors. The house mosquito is usually the more common species in towns and cities in Pennsylvania. The early stages of this insect are passed in water. The eggs are laid upon the surface of the water and soon hatch into tiny wigglers. These creatures are free swimmers in the water, but must come to the surface at frequent intervals for air. The eggs hatch in about twenty-four hours, and the wigglers become mature in about a week's time. The resting stage lasts for about four days hence it will be noticed that the complete life history is run in about two weeks. Mosquitoes not only are troublesome from the painful effects of their "bite," but are also responsible for the carrying of disease to man. Chief of these diseases in Pennsylvania is malaria fever. Yellow fever of the Tropics is also thought to be carried by a Tropical species of mosquito.

**Control.** All bodies of water in which mosquitoes breed, wherever possible should be drained. When drainage is not practical a film of crude oil, or of kerosene may be sprinkled over the surface of the water. In many small streams the mosquito population is kept down by small fish, particularly the species known as the top-minnow. When control measures are not practical, houses and beds should be thoroughly screened against these pests, especially in regions where malaria is known to occur. Many repellants have been used as a protection against mosquitoes. One authority gives commercial creosote oil as a very effective repellent. This material is sprayed about the floor and walls of the building. However, care must be taken since creosote burns and stains quite

<sup>14</sup> *Pediculus capitis* L.

<sup>15</sup> *Culex pipiens* L. and others.

quickly, and must be used only on the roughest material. The following formula will give some protection when freely applied to the face and hands:

Oil of Tar .....	1 ounce
Oil of Citronella .....	1 "
Oil of Cedar .....	1 "
Liquid petrolatum (White oil) .....	1 pint

As in the case with all such preparations, this mixture will lose its effectiveness after continued use. With persons having skins that will stand it, an application of kerosene to the hands and face will repel mosquitoes for quite a length of time.

## HOUSEHOLD PESTS OTHER THAN INSECTS

### Rats and Mice

In older houses rats and mice may oftentimes constitute a serious pest about houses. Wherever possible these creatures should be controlled by proper building; where foundations are tight and cellar windows are properly screened, there is usually little danger of having trouble from these pests.

**Control.** Probably one of the best ways of controlling rats and mice is the employment of traps. Of the various types on the market those of the guillotine type are most successful. Both rats and mice may be baited with nut kernels, bits of lean meat, or cheese. Traps will succeed best if the food supply is made scarce. This means the covering up of any material which may serve as food for these rodents. Oftentimes a good, active cat will control these pests as fast as they may appear in the house. In extreme cases it may be necessary to employ poisoned grain, or even the fumigation of the house with hydrocyanic acid. It has often been noticed that in the fumigation of houses with hydrocyanic acid that the mice and rats all come to the open, before they are killed, thus doing away with the danger of having the creatures die in the walls, or partitions. Calcium cyanide may be used to kill rats in burrows away from the house. This is a dust and is blown into the burrows by means of a duster. It is also poisonous to man.

Barium carbonate is effective in poisoning rats. A variety of baits must be used. One or more of each of the following classes should be tried: (1) Meat. Hamburg steak, sausage, fish, liver, bacon and cheese. (2) Vegetables and fruits. Thin slices of muskmelon, apple, tomato, cucumber, or canned corn, squash, or pumpkin seed; mashed banana, boiled carrot, or baked sweet potato. (3) Cereals. Rolled oats, bread, corn meal, flour or cake, kitchen scraps and garbage can be worked into the ration. The bait should be fresh and preferably good quality. The powdered barium carbonate should be well mixed with soft bait. Use one part of the barium carbonate to four parts of the bait. Add water enough to make the bait moist. On the sliced baits sift the barium carbonate over the surface and rub in with the fingers or a knife. Use at the same ratio that is 1 to 4.



To distribute the bait place a teaspoonful of each of the three or more kinds of baits prepared in exposed places frequented by rats. A convenient method is to place the bait in small paper sacks and close by twisting the top. Do not place near a rat hole but scatter them about. The uneaten baits should be gathered the following morning and destroyed. Soured baits change the barium carbonate to a repellant to the rat. Continue to distribute bait each night using less number of baits.

**Caution:**—Remember barium carbonate is a poison and must be kept away from irresponsible persons especially children, wild life and domestic animals. It is unlawful to use poison baits outside of buildings.

### The House Centipede

This creature is now rather common in Pennsylvania, it being of a southern origin. Centipedes are usually found only in damp cellars, closets, and bathrooms, although they may be seen in any part of the house. For the most part they are considered beneficial in that they eat flies, roaches and other insects which may be about the house. There are a few reports that their bite has proven poisonous to certain persons. The bite is about as poisonous to some persons as the sting of a bee. The "sting" or bite may be relieved by prompt application of ammonia water.

**Control.** The best way of freeing the house of this pest is to kill all centipedes as soon as they are seen. Search should be made for them about water pipes, and in such places it may be worth while to apply a contact insecticide, such as a spray of kerosene.

Various species of spiders may at times be found in houses, but they are harmless and do something toward controlling other insects which are of real harm. However, the tidy housekeeper usually is so prompt in destroying the webs of these creatures that they never become very numerous.

### HOUSE FUMIGATION

Several materials are used in fumigation for the control of household insects. None are entirely satisfactory, and care must be taken to prevent undesirable results no matter what material is employed. For good results in fumigation the space to be fumigated must be made tight. In the case of a house, or room, all windows should be closed, and cracks stuffed shut or closed by pasting strips of paper over them. In a like manner close all openings to the outside, not neglecting the fire places. The temperature must be above 65 degrees F., and preferably between 70 degrees and 75 degrees F. Insects must be active before they can be successfully controlled by fumigation. At temperatures below 65 degrees F. most household insects are quite inactive.

### Sulfur Fumes

The fumes of burning sulfur have long been used for the destruction of insects, and were it not for the fact that these fumes tarnish metal such as brass and silver, and when the atmosphere is at all moist will bleach wall-paper, this method of fumigation



would be the most satisfactory one known. (See following paragraph on danger from sulfur fumes.) When used in heavy con-

#### CAUTIONS IN THE USE OF FUMIGANTS

Extreme care must be exercised at all times when fumigating a house to control troublesome pests. Watch out for the following things:

Sulphur fumes tarnish metals and bleach wall paper.

Hydrocyanic acid gas not only kills insects but is instantly fatal to man.

Carbon bisulfide is inflammable and highly explosive when mixed with air.

Gasoline is accompanied by fire and explosion hazards.

centration, these fumes kill all stages of insect life. In houses which are reasonably tight three pounds to each 1,000 cubic feet of space is recommended. Either flowers of sulfur, or ground sulfur, may be used. The burning should be done in a shallow vessel such as an old wash basin, and this vessel should be placed in another larger vessel such as a galvanized tub in which has been placed two or three inches of earth, sand, or ashes. This is to avoid damage by the sulfur boiling over when burning. A few tablespoonfuls of denatured alcohol are placed on the sulfur heap to help in burning the sulfur. Calculate the volume of the rooms in cubic feet (multiply the height of the room in feet by the length, and this by the width). From this determine the number of pounds of sulfur necessary for the calculated volume. This may be done by dividing the volume by 1,000 and multiplying the result by 3. The house must be tightly closed, and left undisturbed for twenty four hours.

#### Danger in Sulfur Fumigation

The fumes of sulfur tarnish metal, especially brass and silver. Sulfur fumes will bleach fabrics, furnishings and wall-paper; especially is this true in moist weather. Metals may be protected by giving them a liberal coat of vaseline. The choosing of a dry period of weather may help in preventing the bleaching of wall-paper. All delicately colored fabrics should be removed from the building before fumigating with sulfur fumes.

#### Hot Air, or Superheat As a Means of Fumigation

Temperature of from 125 degrees F. to 140 degrees F., if maintained for a period of a few hours, will kill most household insects. It is frequently necessary to keep the heat going for from eight to ten hours to insure penetration to all infested parts; especially is this true of insects attacking, or found about furniture. The heat treatment is recommended for buildings heated with steam, hot water, or hot air. This treatment should not be attempted during the cooler part of the year, and is most successfully used during the hot summer months.

## Hydrocyanic Acid Gas

Hydrocyanic acid gas, when correctly used for fumigation, is probably the most successful from the standpoint of insect kill.

**Caution:**—Unfortunately, the gas is highly poisonous to all forms of animal life, and very slight amounts will produce death to man.

Hence its use is accompanied by this hazard, and none but those quite familiar with its deadly character should attempt its use. The gas is generated by placing the sodium, or potassium salt in water and sulfuric acid. The exact details of procedure will not be given, and before fumigation with this acid is attempted specific directions for its use should be obtained from State or Federal entomologists. In writing for such directions give a complete description of the building in which the proposed fumigation is to be made, together with the distance of the nearest buildings, and their use.

## Carbon Bisulfid for Control of Household Insects

Carbon bisulfide is a very effective fumigant. Here we have a compound which is highly inflammable, and when its fumes are mixed with air it is quite explosive. It is used at the rate of 3 pounds to each 1,000 cubic feet of space or about one ounce to one barrel of space (7,056 cubic inches). The carbon bisulfide is placed in shallow containers where it changes to a heavy gas which acts much like a liquid. This gas should be confined for at least twenty-four hours in the space to be fumigated.

**Warning.** Carbon bisulfide is highly inflammable, and when its fumes are mixed with air the mixture is explosive in the presence of a spark of any kind. Hence all fires must be kept away during the period of fumigation. Because of fire hazards the use of carbon bisulfide is not approved by insurance underwriters. The fumes of carbon bisulfide are heavier than air, and it is advisable to guard against possible leaks of the gas into rooms, or space below such as a basement. Explosions or asphyxiation may occur if sufficient gas accumulates in such places.

Carbon tetrachloride may be used in place of carbon bisulfide. This compound is without fire hazards, but unfortunately, is less toxic to insects. It should be used at double the strength of carbon bisulfide (2 ounces to 7,056 cubic inches), and for a duration of twenty-four hours.

Paradichlorobenzene is a new insecticide which is now extensively used as a control for peach tree borers. It is equally effective in control of insects in articles in storage. The pure crystals should be placed within the container at or near the top. In the case of a bag container, the paradichlorobenzene is placed in a small bag made of cheese cloth, or other open material, and suspended at the top in the inside of the bag. Where a box container is used, place the charge of paradichlorobenzene in a shallow open vessel on the top of the stored goods, after which the lid should be tightly closed and strips of paper pasted over the cracks. Keep the bags and boxes where the temperature will reach 65 degrees or higher. The

amount to use depends upon the volume of the containers used to hold the infested material. About one-half pound should be used to each barrel of space (7056 cubic inches). Two tablespoonfuls will be enough for the ordinary suit or coat bag. Paradichlorobenzene must not be used on food stuff since food is easily tainted with the fumes. Care must be taken to keep the crystals from long contact with the finish of furniture since much harm may result from continued exposures.

Ofttimes after a contagious disease has been in a home, health authorities advise the use of formaldehyde generators in fumigating houses against the germs of the disease. The question is frequently asked whether or not this material is effective in the control of household insects. Unfortunately, fumes of formaldehyde are not toxic to insects, hence its use is of no value in the control of household pests.

# PENNSYLVANIA DEPARTMENT OF AGRICULTURE

## Organization and Services

C. G. JORDAN, *Secretary of Agriculture*. R. G. BRESSLER, *Deputy Secretary*.

This Department is essentially a service agency created by legislative enactment to deal with administrative, regulatory, investigational, and educational problems which can best be solved through public rather than individual action. The organization provides for coordination and cooperation with the Pennsylvania State College and the U. S. Department of Agriculture. The Department operates through the following bureaus:

### ANIMAL INDUSTRY:

T. E. MUNCE, *Director and State Veterinarian*.

Prevents and eradicates transmissible diseases of animals and poultry, including tuberculosis of animals in cooperation with Federal Government.

Demonstrates to veterinarians control methods for transmissible animal diseases:

Supervises vaccination for and the prevention of hog cholera, anthrax, black leg and hemorrhagic septicaemia;

Protects public from unwholesome meats through ante and post mortem examinations of animals at slaughtering establishments;

Inspects, licenses and furnishes information as to breeding, soundness and conformation of stallions and jacks standing for public service;

Enforces law requiring licensing of dogs and providing for protection of livestock and people from attacks of uncontrolled dogs;

Maintains laboratory for diagnostic research and experimental projects.

### PLANT INDUSTRY:

R. H. BELL, *Director*.

Tests agricultural seeds for purity and germination, and enforces State Seed Law;

Inspects orchards, parks, farms, and plant imports for injurious insects and plant diseases.

Inspects and licenses Pennsylvania nurseries, and licenses all dealers in nursery stock.

Enforces laws governing apicultural practices, disease control and housing;

Places and enforces quarantines and carries on eradication campaigns against insect pests and plant diseases.

Inspects and certifies potatoes for seed purposes;

Makes investigations for the control of injurious insects and plant diseases including field tests of insecticides, fungicides and weed killers;

Maintains collections of insects, plant diseases, plants, and seeds, and identifies specimens.

### FOODS AND CHEMISTRY: JAMES W. KELLOGG, *Director—Chief chemist*.

Accomplishes its purpose of protecting Pennsylvania homes against harmful foodstuffs by sampling, analyzing, and bringing prosecution under the laws relating to foods and non-alcoholic drinks, including milk, cream, butter, ice cream, eggs, sausage, fresh meats, soft drinks, fruit syrups, vinegar and kindred food products;

Regulates and issues licenses for the manufacture and sale of oleomargarine;

Licenses and regulates egg-opening plants and cold storage warehouses, maintaining regular inspection and enforcing twelve-month storage limit;

Inspects milk plants and creameries and regulates weighing, testing, buying and selling of milk and cream on a butterfat basis;

Protects honest manufacturers, importers, selling agents and ultimate users of feeding stuffs, fertilizers, lime products, linseed oil, paint, putty, turpentine, insecticides and fungicides, by means of annual registrations followed by inspections, analyses, prosecutions and the publication of the analyses of these products;

Analyzes special samples for residents of the State at the rate of \$1.00 a sample for feeding stuffs, lime products and linseed oils.

### MARKETS:

P. R. TAYLOR, *Director*.

Investigates and assists in the marketing of farm products; at present chiefly grain and hay, fruits and vegetables, poultry and eggs, and tobacco;

Compiles and distributes daily market information as to supplies, shipments and prices;

Advises growers on transportation of agricultural products;

Assists cooperative associations and public markets;

Establishes standard grades of farm products and maintains inspection.

### STATISTICS:

L. H. WIBLE, *Director*.

Assembles and disseminates essential statistics and facts pertaining to the agriculture of the State, from monthly reports rendered by hundreds of volunteer crop correspondents, information which assists the producer in his sales and interests all industries which deal with agricultural products;

Cooperates with U. S. Bureau of Agricultural Economics in joint crop, and livestock reporting and publishes annual and monthly summaries of the data;

Compiles dates of county and local fairs and assembles data pertaining to their success and results during each year.